Amendments to the Claims

1. (currently amended) A computer implemented method for detecting components of a non-stationary signal, comprising a computer system for performing steps of the method, comprising the steps of:

acquiring the non-stationary signal with a sensor;

constructing a non-negative matrix of the non-stationary signal in a matrix buffer of the computer system, the matrix including columns representing features of the non-stationary signal at different instances in time, in which the non-negative matrix has M temporally ordered columns where M is a total number of histogram bins into which the features are accumulated, such that $M = (L/2+1)$, for a signal of length L; and

producing characteristic profiles and temporal profiles of the non-stationary signal by factoring the non-negative matrices.

2. (canceled)

3. (canceled)

4. (currently amended) The method of claim 1 ~~2~~ in which the non-negative matrix is expressed as $R^{M \times N}$, the temporal profiles are expressed as $R^{M \times R}$ and the characteristic profiles are expressed as $R^{R \times N}$, where $R \leq M$, where R is a number of components to be detected.

5. (original) The method of claim 1 in which the non-stationary signal is an acoustic signal.

6. (original) The method of claim 1 in which the non-stationary signal is a 2D visual signal.

7. (original) The method of claim 1 in which the non-stationary signal is a 3D-scanned signal and frames of the signal represent volumes.

8. (original) The method of claim 4 in which the number of components R is known.

9. (original) The method of claim 4 in which the number of components R is an estimate number of components.

10. (previously presented) The method of claim 1, further comprising:

detecting components in the non-stationary signal according to the characteristic profiles and temporal profiles.

11. (previously presented) The method of claim 1, in which the non-negative matrix is $\mathbf{F} \in \mathrm{R}^{M\times N}$ and the non-negative matrix $\mathbf{F} \in \mathrm{R}^{M\times N}$ is factored into two non-negative matrices $\mathbf{W} \in \mathrm{R}^{M\times R}$ and $\mathbf{H} \in \mathrm{R}^{R\times N}$, where $R \leq M$, such that an error in a non-negative matrix reconstructed from the factors is minimized.

12. (previously presented) The method of claim 8, in which a cost function is

$$C = \| \mathbf{F} - \mathbf{W}\cdot\mathbf{H} \|_F,$$

where $\|\cdot\|_F$ is a Frobenius norm, and C is zero if $\mathbf{F} = \mathbf{W}\cdot\mathbf{H}$.

13. (previously presented) The method of claim 8, in which a cost function is minimized according to

$$D = \left\| \mathbf{F} \otimes \ln\left(\frac{\mathbf{F}}{\mathbf{W} \cdot \mathbf{H}}\right) - \mathbf{F} + \mathbf{W} \cdot \mathbf{H} \right\|_F ,$$

where $\otimes$ is a Hadamard product, and D is zero if $\mathbf{F} = \mathbf{W} \cdot \mathbf{H}$.

14. (previously presented) The method of claim 10, in which the non-stationary signal is music and the components are notes.

15. (previously presented) The method of claim 10, in which the non-stationary signal is visual and the components are spatial features in frames of the video.

16. (previously presented) The method of claim 1, in which the non-stationary signal includes an acoustic signal and a visual signal acquired simultaneously.

17. (previously presented) A system for detecting components of a non-stationary signal, comprising:

a sensor;

an analog-to-digital converter;

a sample buffer;

a transform;

a matrix buffer; and

a factorer serially connected to each other, in which an acquired non-stationary signal is input to the analog-to-digital converter to output samples to the sample buffer, in which the samples are windowed to produce frames for the transform, which outputs features to the matrix buffer as a non-negative matrix,

which is factored to produce characteristic profiles and temporal profiles, in which the non-negative matrix has M temporally ordered columns where M is a total number of histogram bins into which the features are accumulated, such that $M = (L/2+1)$, for a signal of length L.

18. (canceled)